Course Syllabus

Landscape Ecology

Course numbers: 11:216:450 (undergraduate) / 16:215:520 (graduate) *3 cr.*

Instructor: Dr. Marci Meixler (meixler@sebs.rutgers.edu)

Prerequisite: 11:216:351 or equivalent

Meeting times/places

Wednesdays 12:35-1:55pm
ENR 237

Course Website: If you are registered for this course, you should have access to the course website.

Description

Ecology is the scientific study of the interactions between organisms and their environment. Landscape ecology is a sub-discipline of ecology, focusing on spatial relationships and the interactions between patterns and processes. This course provides a comprehensive introduction to the field by coupling theoretical concepts with applications through modeling projects to provide hands-on practical experience with landscape analysis tools and ideas.

Learning goals

- Students will be able to describe and differentiate available methods for detecting and characterizing landscape patterns and causes of landscape patterns
- Students will explore and be able to explain the implications of landscape pattern on populations, communities and ecosystems
- Students will be able to describe mechanisms by which patterns and processes change (i.e. landscape dynamics) and relate them to strategies by which humans manage landscapes

Textbooks (recommended):

Turner, M. G., Gardner, R. H., O'Neill, R. V. 2015. Landscape Ecology in Theory and Practice: Pattern and Process. Second Edition. New York, Springer-Verlag.
Books are on reserve at Chang Library

Grading System

The course is comprised of online lectures, weekly outlines, labs, review assignments, case studies (for grads), a lab project and exams with a requirement of attendance and participation.

Readings: weekly readings can be found in our textbook

Online lectures: you can find these on the course website

Weekly lecture outlines: Students are expected to watch the lecture videos, take notes, sketch out thoughts on discussion questions before class and join in discussion during class. Specifically,

all students are required to turn in an outline each week that discusses the important points from the lecture video (this can be in whatever format you like and should be complete enough to show us you got the main ideas from the lecture) and includes 2 questions that can be used to stimulate discussion. Weekly outlines should be submitted online. Acceptable formats include word and pdf.

Labs: Labs will be completed each week with corresponding homework assignments. These are due before class each week. Submit online.

Review assignments: Please submit one question and answer for each lecture topic to be covered on the coming midterm or final exam. Questions can be any form (T/F, multiple choice, short answer, essay, etc). Assignments are due by midnight on the due date. Late penalty: 50% off for each day late.
Case studies (grads only): There will be weekly case studies related to the topic of the week. Graduate students will be responsible for creating the case studies (more info on this in the Graduate Students section below).

Case studies (for grads): see below

Lab project: the project is designed to help you become familiar with: 1) the process of determining the correct scale and extent, 2) model design and creation, 3) interpretation of results, 4) exploring management implications, and 5) experiencing a landscape ecology project from start (idea conception) to finish (presentation of results). We will work on this in groups and together as a class. Results will be presented at GIS day. More details below.

Exams: There will be one midterm and a final exam. Medical note required for makeup exams.

Participation & Attendance: This is critical to understanding the lecture material. Participation improves the quality of the class for everyone. This portion of your grade will be determined at the end of the course based on average attendance and participation throughout the semester. For grad students, case studies will count as part of their participation grade.

Graded item	**Undergrads%**	**Grads%**
Participation & Attendance	5%	5%
Weekly outlines (12) and review assignments (2)	15%	15%
Case studies (grads only)	0%	5%
Labs	15%	15%
Lab project	35%	30%
Midterm Exam	15%	15%
Final Exam	15%	15%

Lab project

Students are asked to complete a project (as a group with fellow undergraduates or graduates, respectively) that applies some of the concepts and tools covered in lab to an unanswered question or issue relevant to the field of landscape ecology. The specific task is to use spatial data and spatial analyses to address a question or issue and to prepare a written report in the form and style of a Research Article for the journal *Landscape Ecology* (http://www.springer.com/life+sciences/ecology/journal/10980). Maximum length 8500 words. The report should include title page, abstract, introduction, methods, results, discussion, acknowledgements, literature cited, figures and tables. Intermediate deadlines will help keep you on track.

Project grading rubric:

Project proposal (question, objectives, data requirements, analysis techniques and who will be responsible for each task)	10%
Data sources	5%
Analysis diagram	5%
Preliminary results	10%
Preliminary interpretation (meaning of results and management implications)	10%
GIS presentation/poster	10%
Paper (quality of writing & research, inclusion of all sections, proper formatting)	50%
Optional peer evaluation (will factor into overall participation grade)	------
Total	**100%**

Case studies (grads only)

Case studies are helpful in linking theoretical concepts to application of those concepts in real life. Graduate students will be responsible for presenting case studies based on research papers/articles related to the topic of the week. Presentations should be 5-10 minutes in length and should touch on the main topics of the lecture that week while also bringing to light an advance in landscape ecology research related to the topic. ***You will be responsible for presenting your case study to the class and leading a short discussion afterwards on the main points of the lecture video and the related case study. Make your presentation as interactive as possible to create more opportunities for class discussion.*** Make sure to include citations in your presentation.

Signups for case studies should be done on the course website under "case study signup."

Your case study should be submitted to the course website by the due date. I will make each case study presentation available to the rest of the students on the course website.

Graduate students

Graduate students will be expected to work at a higher level than undergraduates. As such, graduate students will:

1) go more in depth in the class project than undergraduates
2) do comprehensive presentation on GIS day
3) present case studies relating to the topic of the week and lead short discussion about the main points of the topic each week
4) contribute meaningfully to in lab discussions

Performance in these activities will be reflected in your participation grade.

Lecture schedule (online)

All outlines due before class the following week. Review questions/answers and case studies are due midnight before class.

Week		Online lecture Topic	Turner et al. Book chapter	Case study (grads)	Due dates
1		Introduction to landscape ecology	1		
2		Scale and hierarchy theory	1	Case study intro	Outline intro
3		Models	3	Case study scale	Outline scale
4		Causes of landscape patterns	2	Case study models	Outline models
5		Quantifying landscape patterns	4	Case study causes of landscape patterns	Outline causes of landscape patterns
6		Landscape limnology	8 (p.308-311)	Case study quantifying landscape patterns	Outline quantifying landscape patterns
7		**Midterm exam online (take before midnight Oct 15)**	10	Case study landscape limnology	Outline landscape limnology Review questions/answers (midnight before class)
8		Landscape change in NJ	LU change in NJ report		
9		Disturbances	6	Case study landscape change in NJ	Outline landscape change in NJ

10		Organisms and landscape pattern	7	Case study disturbances	Outline disturbances
11		Ecosystem processes	8	Case study organisms and landscape pattern	Outline organisms and landscape pattern
12		GIS day (applied LE) Present at GIS day	9	Case study ecosystem processes	Outline ecosystem processes
13		No class (Fri classes)			
14		Landscape genetics	Landscape genetics article		
15		**Final exam online (non-cumulative, take before midnight Dec 10)**	10	Case study landscape genetics	Outline landscape genetics Review questions/answers (due midnight before class)

Lab Schedule

Week	McGarigcal et al. book chapter	Lab task	Lab concept	Tool	Landscape	Project task	Due
1	1	Data visualization	Lab1: Intro to GIS: viewing and analyzing spatial data	ArcGIS 10.3, ArcMap	Mozambique wildlife reserve		
2	1	Data visualization	Lab2: Intro to GIS II: analyzing and displaying	ArcGIS 10.3, ArcCatalog, ArcToolbox,	Mozambique wildlife reserve	(pick topic / question)	Lab1 Bring LE article to

			spatial data	Geoprocessing			class
3		Modeling	Lab3: Spatial data collecting and model building	ArcGIS 10.3, Model Builder	Oregon fires	(choose models)	Lab2 Project proposal
4		Landscape analysis	Lab4: Analyzing habitat-species relationships & stats	R 3.1.1	NW Ontario birds	(obtain data)	Lab3 Data sources
5		Landscape analysis	Lab5: Quantifying spatial pattern	ArcGIS 10.3, FRAGSTATS 4.2	NJ heritage priority sites	(Create algorithm)	Lab4 Analysis diagram
6		Landscape analysis	Lab6: Suitability modeling	ArcGIS 10.3	WV Wind farms	(begin analysis)	Lab5
7		Landscape analysis	Lab7: lab will be based on project needs (or time spent on project work)**	?	?		Lab6
8	3	Cluster analysis	Lab8: Landscape management	ArcGIS 10.3	Coopers Rock park WV		
9	4	Discriminant analysis	Lab9: New Jersey Landscape Project	Webmapper software	New Jersey	(finish analysis)	Lab8 Results
10	2	Principle components analysis	Lab10: Analyzing connectivity	Circuitscape	Hypothetical landscape	(interpret data/mgmt implications)	Lab9 Interpretation
11		Landscape exploration	Lab11: Modeling ecosystem processes	Excel	Hypothetical ag landscape	(create presentations/posters)	Lab10
12		Project day	Practice presentations			(write methods & results)	Lab11 GIS day presentation / poster
13		No class (Fri classes)					

14		Project day				(write introduction)	Optional peer evaluation
15		Project day				(write discussion)	Paper

**** Project specific topics could include: ADVANCED MODELBUILDER, ADVANCED R, SPATIAL STATISTICS, PYTHON PROGRAMMING, GEODA, HOME RANGE ESTIMATION IN GME, ETC. DEPENDS ON THE PROJECT NEEDS**